GROWING GRAIN ON SOUTHERN IDAHO DRY FARMS

L. C. AICHER

Assistant Agronomist, Office of Cereal Investigations

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WM. A. TAYLOR, Chief

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GROWING GRAIN ON SOUTHERN IDAHO DRY FARMS.

CONTENTS.

INTRODUCTION.

Dry-land farming is comparatively new in southern Idaho. Sagebrush land is continually being made ready for the plow, and the area in dry farms is rapidly increasing. As Idaho is one of the few States in which land is still available for entry under the homestead

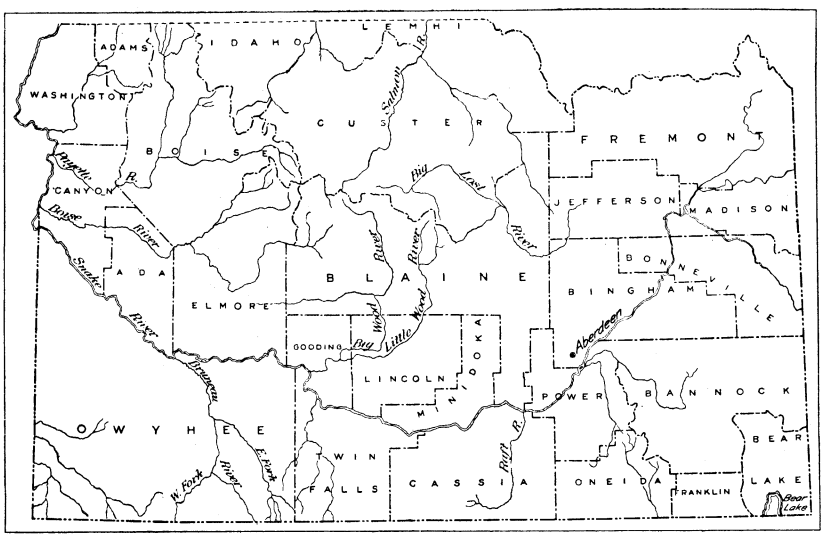

FIG. 1.—Map of southern Idaho, showing the Snake River basin and the location of the Aberdeen Branch Experiment Station.

act, people are attracted from nearly all walks of life and from many sections of the United States.

These people bring to Idaho different systems of farming, different varieties of crops, and different modes of living. While many of them succeed, many fail in dry farming. These settlers need reliable

information which will enable them to make homes on the dry farms as quickly and at as little expense as possible. Much of the available information on dry farming is in such form that it can not be used to advantage.

For these reasons a conservative, up-to-date bulletin on dry farming in southern Idaho is greatly needed. It is hoped that the present paper may meet this requirement. The results obtained at the Aberdeen Branch Experiment Station[1] since its establishment in 1911 are used as a basis. Facts from the experiences of many of the most successful dry farmers in the State and from bulletins published in near-by States are also included.

The principal crops grown on the dry farms of southern Idaho are wheat, oats, barley, and field peas. Winter wheat is the great commercial crop on the dry farms of the Snake River basin. Three-fourths of the dry-farm cereals produced in Idaho is winter wheat.

In this bulletin a brief description of the climate and soils of southern Idaho is first given. The equipment of the dry farm is then discussed, followed by directions for growing the principal grain crops and recommendations as to the best varieties to grow.

THE SNAKE RIVER BASIN.

The statements in this bulletin apply to the Snake River plains of southern Idaho and the dry-farmed valleys opening into this great basin. This section includes most of the counties of Fremont, Teton, Jefferson, Madison, Bonneville, Bingham, Bannock, Bear Lake, Franklin, Oneida, Power, Cassia, Minidoka, Blaine, Lincoln, Twin Falls, Gooding, Owyhee, Elmore, Ada, Canyon, Boise, Washington, and Adams. (Fig. 1.) Irrigation is largely practiced in some of these counties, but only dry-farm crops and practices will be discussed here.

The elevation varies from 6,500 feet in the upper Snake River basin near the Wyoming line to 2,100 feet in the lower part of the basin, close to the Oregon line.

Elevation and moisture supply are the controlling factors in dry farming in southern Idaho. The growing season varies in length from about 75 days at the higher elevations to about 140 days at the lower levels. The number of crops grown is not as great, however, as might be expected. This is due largely to the lack of sufficient moisture for growing spring crops profitably and to the cold nights,

[1] The Aberdeen Branch Experiment Station was established at Aberdeen, Idaho, in the fall of 1911. The Aberdeen Commercial Club obtained a 15-year lease on 80 acres of land for the State. The club also supplied the funds to erect buildings and fences and to install a water system in the buildings.

The station is maintained by the Idaho Agricultural Experiment Station and the Bureau of Plant Industry in cooperation. The land was cleared and made ready for crops in 1912, and the first crop from the dry farm was obtained in 1913.

which prevent growing the more tender crops. Dry farming is being practiced as high up in the mountain valleys as the freedom from summer frosts and the length of the growing season permit.

CLIMATE.

The general climate of the Snake River plains is arid or semiarid. The climatic conditions vary greatly, however, owing to variations in altitude and the influence of adjacent mountains.

In the upper Snake River country the temperature seldom rises higher than 90° F. in summer or falls lower than 15° or 20° below zero in winter. At the lower elevations near the Oregon line summer temperatures of 100° or higher are often reported, while the winter minimum seldom reaches zero. Throughout this section the daily range of temperature is very great. The nights are usually cool, accounting in a large measure for the poor growth of corn and sorghum in the upper Snake River country.

The average yearly rainfall of the Snake River plains is 10 to 13 inches. At the high elevations it is greater than in the valleys. The distribution of summer rainfall is very irregular. In the mountain valleys the snowfall is much heavier than on the plains. Warm Chinook winds cause rapid melting of the light snowfall on the plains, with the result that if the ground is frozen this moisture escapes as run-off.

Westerly winds prevail over the Snake River plains. In summer and fall the winds are frequently strong in the afternoon. The average daily wind velocity is not more than 7 miles an hour.

At the higher elevations frosts occur at frequent intervals during the growing season. These late spring and summer frosts often cause severe losses. Frost limits the number and variety of crops which can be grown in these particular sections.

SOILS.

The soils of the Snake River plains are of volcanic origin. Most of the soil covering the plains at a distance from the mountains and outside the canyons is fine material redeposited by the wind. It is a yellowish white silt composed mainly of small quartz particles. The most common soil type is a sandy clay loam.

The high bench and mountain-valley soils are largely mountain wash or alluvial. This soil type is also a sandy clay loam, but contains more decayed vegetable matter. The mountain soils also contain more sand and gravel than the plains soils and take up more of the water of heavy rains. The color of the mountain-wash soils is a reddish brown. A view of a portion of the Rockland bench in the Rock River valley, Power County, is shown in figure 2.

In the upper Snake River plains small areas of gravelly soil are found. Where this gravel is 4 or 5 feet below the surface dry farm-

ing is fairly profitable. If the gravel is close to the surface dry farming is almost out of the question. Much depends, however, upon the nature of the deposit. If considerable soil is mixed with the coarse sand and gravel, the land may be farmed with profit. Gravelly soil can not hold water as does a clay soil, and care should be taken when selecting a dry farm in a locality where gravel exists.

In some sections of the Salmon River valley and farther west a limestonelike hardpan is found at varying depths below the surface. As in the case of the gravel, if this hardpan is several feet below the surface the land can be dry farmed with profit. If it is close to the surface, however, the land is not well adapted to dry farming.

Humus and nitrogen are lacking more or less in the southern Idaho soils. The dry farmer on the plains is handicapped because of lack of sufficient moisture in the soil to rot any great quantity of vegetable matter. Straw, manure, and legumes should be used to help build

FIG. 2.—A part of the wheat-growing Rockland bench in the Rock River valley of southern Idaho. One range of the Bannock Mountains is shown in the background.

up the dry-land soils, but owing to the light rainfall this must be done very slowly.

The dry-farm soils, if properly farmed, will yield good returns. If a profitable rotation can be planned, a permanent dry-farm agriculture practically is assured.

DRY-FARMING MACHINERY.

The machinery needed on a dry farm varies with the size of the farm, the kind of soil, the horsepower available, the rapidity with which the work must be done, and, most important of all, the efficiency and economy of operation.

The average dry farm on the Snake River plains is about a half section, or 320 acres. This is the acreage which is granted as a homestead to settlers. Farming on the dry lands of Idaho is so recent that there are as yet few large holdings. There are a few bonanza wheat farms in the upper Snake River basin, on the Rockland bench in Power County, and in the upper Weiser River district. These

bonanza farms usually include some of the best land in the locality.

The proportions of clay and sand vary considerably in different soils. A plow which works well on the lower plains may not be adapted to the high bench and mountain-valley lands. The proper kinds of machinery for the various districts are usually obtainable from local implement dealers.

The implements a dry farm should have are a moldboard plow, a double-section disk harrow, a spike-tooth harrow, a drill, a header, and wagons. Desirable additional equipment includes a weeder of some good type, a grain binder on the bench lands, and a corrugated roller. Machinery for clearing land is not included in this list and will not be discussed in this paper.

It is not economy to use small machinery on a dry farm. A sufficient number of horses must be kept to handle large machinery. A 4-horse team is considered a small unit. Five or six good horses can handle a 2-bottom gang plow, a 6-foot double-section disk harrow, a 5-section spike-tooth harrow, and a 16-hole 7-inch drill. The minimum power unit for efficiency on a 320-acre dry farm is five horses. On the other hand, seven horses would be considered the largest efficient unit on such a farm, unless other work can be obtained.

Successful dry farming requires getting on the land at the right time. This requires large machinery, to cover a maximum acreage in a day. Bad weather often delays work. When it is possible again to get on the land, weeds may be growing rapidly, and quick work is needed to keep them under control.

It is not economy to purchase a 10-horse equipment, furnish and feed 10 horses, and then permit them to be idle because of lack of work. Money is made by keeping a medium equipment busy throughout the year. This can be done by a proper arrangement of fall and spring work.

Spring plowing for fallow done at the right time and in the right way yields as much winter wheat as fall plowing. Hence, it is not necessary to maintain enough horsepower to handle both fall sowing and fall plowing for fallow. Divide the work. It pays.

PLOWS.

Good plowing is essential, and plows should be selected with great care. It is better to buy a 2-bottom gang plow and put on a 6-horse hitch than to buy two single-bottom plows and put a 3-horse hitch on each. The wage of a teamster is saved, and a little more work is done in a day by using the 2-bottom plow. Where sufficient horses are available and the work to be done demands and warrants their purchase, 3-bottom plows can be used to advantage. In early

spring plowing it is best to add an extra horse and tie a small harrow behind the plow. Thus the teamster plows and harrows at one operation, and the prompt harrowing saves moisture. In fall plowing the harrow should not be used, as it is better to leave the land rough over winter to catch snow and rain and to prevent soil blowing in the spring.

The disk plow has only a limited use on the average dry farm in southern Idaho. It has special value in plowing hard, dry ground in summer, stony land, trashy sagebrush land, or the sticky clay spots found in some sections of southwestern Idaho. Turning under brush, however, is not a good practice, for it leaves the soil loose and rough. Much moisture is lost, and a good seed bed can not be made. The dry farmer can not afford to plow land when it is hard and dry. Land should be plowed when it is in proper condition. This usually can be done in a normal year. When the soil is in good condition to plow, the disk plow requires as much power and a better teamster to do the same quality and quantity of work as a moldboard plow. The moldboard plow is preferable because it leaves a flat furrow bottom, pulverizes the soil to a greater extent, and provides a more uniform seed bed.

THE DISK HARROW.

A 6-foot or 7-foot double-section disk harrow is one of the most important tools on a dry farm. A cutaway front section followed by a full-disk rear section is to be preferred. This is an effective tool on hard stubble ground. It does better work than a double section of full disks or a front section of full disks and a rear section of cutaway disks. This machine requires from five to seven horses. The double-section disk harrow should have a movable or hinge-joint frame rather than a rigid frame. The front and rear sections should work independently, and the set of each of the four units should be controlled independently by its own lever.

THE SPIKE-TOOTH HARROW.

A good spike-tooth harrow is absolutely necessary on a dry farm. A 5-section or 6-section harrow makes an efficient tool on a 320-acre farm. With this implement various kinds of work can be done, if it is provided with levers to change the slant of the teeth. It can then be used in smoothing land and killing weeds or in cultivating the growing crop, if desired.

THE DRILL.

Single-disk drills are used almost exclusively on the Idaho dry lands. This is largely because the seed bed always contains more or less sagebrush and roots, and sometimes straw. The disk cuts through hard ground, straw, and small brush, whereas the hoe drills

and shoe drills clog and cause trouble. The double-disk drill can not be made to go deep enough in some of the soils, although this drill may have a place on some of the land longest farmed.

Scudder[1] states that "on a clean well-prepared seed bed, the hoe drill is satisfactory, but the double-disk furrow opener is perhaps even better, as it gives a better distribution of seed." The opinions of dry-land farmers in various sections of the State favor the single-disk drill, for it does good work under nearly all conditions.

Press-wheel attachments are favored in some parts of the State. Where the soil is coarse and loose they doubtless can be used to advantage. The use of this attachment requires a little more horse-power to handle the drill. Opinion is much divided as to the value of press wheels, the opinions varying with the section, which no doubt indicates that different soils require different treatment.

WEEDERS FOR FALLOW.

The spike-tooth and disk harrows are effective weeders, but there are times when they can not and should not be used. The spike-tooth harrow is effective when the weeds are very small. The disk harrow is effective when the weeds are so well rooted that no other tool will kill them. Disking, however, is expensive and often pulverizes the soil more than is desirable. Various weeders, home-made and manufactured, are now in use. Many of them are cheap, effective, easily operated, and will cover a large acreage in a day.

The "slicker," or knife weeder, is a tool 6 to 12 feet in length. One of the simpler forms is made by nailing boards or planks on top of three or four 2-inch by 8-inch sled runners 3 feet long, with a blade bolted under the middle or the rear end of the runners. This blade is made of a 3-inch iron bar half an inch in thickness and sharpened on the front edge. In the bar weeder, a round five-eighths-inch or three-fourths-inch rod is used instead of a blade. A 6-foot running board is nailed across the top in the middle of the machine and extends to the rear. The driver stands on this board and regulates the dip of the knife or bar by shifting his weight forward or backward. The blade is cleaned by lifting the rear end of the machine. The blade of the slicker should be made of the best steel and kept sharp.

ROLLERS AND PACKERS.

A few farmers are now using the corrugated roller to firm the summer fallow after plowing, to firm spring-plowed land which is to be sown to spring grains, and to break crusts and close up large cracks in the fields of winter wheat. These cracks usually appear

[1] Scudder, H. D. A report of the experimental and demonstration work on the substation farms at Moro, Burns, Redmond, and Metolius. Pt. I. Tillage and cropping methods. Oreg. Agr. Exp. Sta. Bul. 119, p. 54. 1914.

on the heavier soils, especially after a winter of heavy snowfall, and are often 3 to 4 inches deep. The corrugated roller has been used with good results for these purposes at the Aberdeen Branch Experiment Station. This roller not only closes the cracks, but loosens the surface soil, thus preventing further baking and hardening.

The subsurface packer has not proved to be of much value on the dry lands of Idaho. Its limited field of usefulness does not warrant the purchase of the machine on the average dry farm.

HARVESTING MACHINERY.

The header is the most important harvesting machine on the dry farm. It is used extensively in all sections of the State. The header consists of a raised grain table, equipped with sickle, moving canvas apron, and revolving reel, as in the binder. Unlike the binder, the header removes only the heads and upper part of the stems. These are elevated directly to a large wagon box and hauled

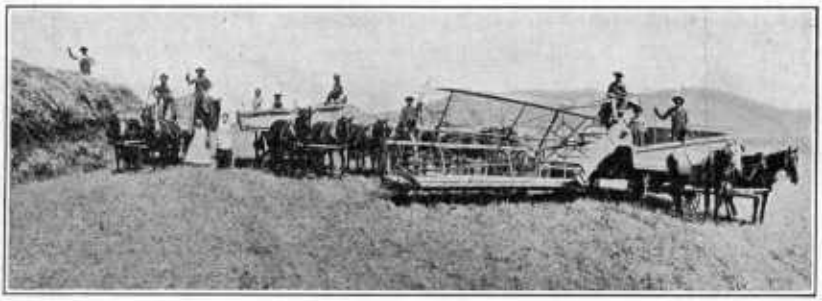

FIG. 3.—Complete outfit for heading grain, consisting of a header and three header wagons, near American Falls, Idaho.

either to a stack or to a separator. A complete equipment for heading grain is shown in figure 3. Figure 4 shows the thrashing of headed grain from the stack, and figure 5 the thrashing of grain hauled directly from the header to the separator.

On the mountain bench and valley lands binders are used to a considerable extent. In these sections the straw is much longer than on the plains. Bound grain can be handled better than headed grain. Grain also is bound in these sections because it often is impossible to get a thrashing outfit to the farm. This makes it necessary to haul the bound grain to the separator.

Binders also are used to a considerable extent to cut green wheat for hay. Bound wheat hay can be handled much easier than loose hay. Since it is not raked from the ground it never contains as much dust as loose wheat hay. Not all binders, however, will cut green wheat and tie it.

The combined harvester-thrasher, or combine, is used in nearly all sections of the State. This machine has come to stay. It con-

sists essentially of a long platform and elevating aprons, as in the header and the binder, attached to a portable separator. Thus grain is cut and thrashed at one operation. Great improvement has been made in the combine in recent years.

All combines until recently were large machines. The original large combines required 30 or more horses to pull them. In some

FIG. 4.—Thrashing headed grain from the stack in southern Idaho. The straw is blown into hayracks and hauled for feeding.

sections of the United States even larger combines were developed which required powerful tractors to operate them. The capacity of such combines varies from 30 to 75 or more acres a day, depending upon the width of the cut. Large combined harvesters and thrashers drawn by horses are shown in figure 6, and one drawn by a gas tractor is shown in figure 7. Small combines are now made which can be pulled by six to eight horses. These small

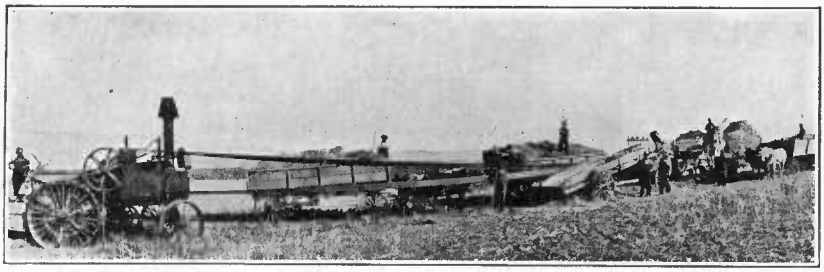

FIG. 5.—Thrashing from a header outfit in southern Idaho, using a straw-burning engine.

machines have from a 6-foot to an 8-foot cut and will harvest about 15 acres per day. One of the smaller combines, which requires only 12 horses to operate it, is shown in figure 8.

The addition of an auxiliary engine to run the cutting and separating machinery makes a combine run much steadier, and better work is done. This also reduces the number of horses needed, as the only power required is that which pulls the machine over the ground.

The combine has been criticised because the cost of sacks increases the cost of harvesting and because weed seeds are distributed over the land if weeds are present in the ripened grain. An Idaho farmer has saved the cost of sacks by erecting an elevator on the farm and hauling the wheat in bulk from the combine to this elevator. The

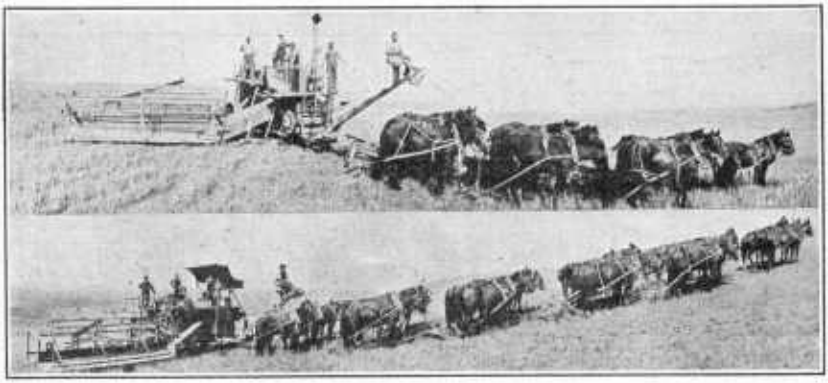

FIG. 6.—Two combined harvesters and thrashers drawn by horses near American Falls, Idaho. The upper combine is equipped with an auxiliary gasoline engine to run the harvesting and thrashing machinery, 14 horses being required to pull the machine. Below is a combine of the same size without an auxiliary engine, requiring 28 horses to draw the machine.

thrashed wheat runs directly from the separator into a receiving bin on top of the combine and thence to the wagons. If a wagon fails to reach the combine in time, this large receiving bin takes care of the surplus until the wagon arrives. Thus the harvesting goes on continuously, as it is not necessary for the combine to stop and wait for wagons.

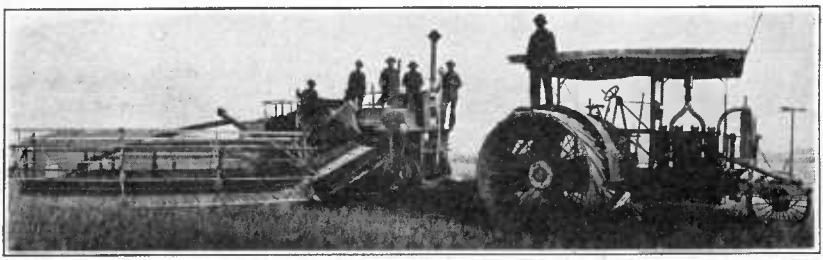

FIG. 7.—A combined harvester and thrasher equipped with an auxiliary engine and drawn by a gas tractor on the Camas Prairie, southern Idaho.

The purchase of a combine or other thrashing outfit is not profitable on a small dry-land farm. A group of two or three farmers can buy such equipment together to much greater advantage.

When a crop is to be harvested with a combine, care should be taken to grow varieties which do not shatter. Wheat must be fully ripe or overripe before good work with a combine can be done.

Turkey wheat is well adapted for combine harvesting, because it holds the seed well when fully ripe.

GOOD SEED.

HOME-GROWN OR IMPORTED SEED.

Wheat growers and seedsmen often claim that wheat "runs out." Some of the best farmers in southern Idaho ship in Turkey wheat from other localities every three or four years because they say their seed is running out. These growers think that yields decrease and the percentage of yellow berry increases each year the crop is grown.

This is not really the case. If properly handled, the quality of the crop can be improved or at least maintained as long as it is grown in a community. The variety becomes adapted to local climatic conditions. If the conditions are severe, only the best and most fit plants survive.

FIG. 8.—A small combined harvester and thrasher requiring 12 horses and two men for its operation.

The results of many experiments prove conclusively that the source of seed has nothing to do with the proportion of yellow berry in the crop in any year. It is proved also that decreased yields need not result from using home-grown seed. Other factors are responsible for the low yields.

GRADING THE SEED.

Grading the seed with a fanning mill will do more to maintain yields than the introduction of new seed. Blow out all the chaff, straw, and shrunken kernels. Sow only plump seed, which contains plenty of food to supply the sprouting plant until the roots are able to obtain food from the soil. Plump grain also is less injured by the smut treatment and always germinates better than shrunken seed. Get a pure, high-yielding variety from your State experiment station or some other reliable source and then take good care of it.

TREATING WHEAT FOR BUNT OR STINKING SMUT.

The first essential in treating wheat for bunt or stinking smut is to fan the grain well, thus blowing out all light material and any smut balls that may be present. If smut balls still are present, put the wheat in a barrel of water. The balls come to the surface and can be skimmed off. The water is then drained out of the barrel, and the seed resacked and made ready for immediate treatment in the smut-destroying solution.

The formaldehyde treatment for stinking smut requires soaking the grain about 10 minutes in a solution of 1 pint of commercial formaldehyde to 45 gallons of water. The seed should then be dumped in a pile, preferably on a canvas, and covered for two hours. This is done to distribute the formaldehyde gas throughout the pile and to prevent the escape of the gas. The seed then should be spread out thinly on a canvas, dried sufficiently to sow in the drill, and put in sacks which have been dipped in the formaldehyde solution. The hopper and tubes of the drill should also be cleansed with the solution, in order to keep the treated seed free from smut. It is useless to treat seed and then sow it in a drill which has smut spores in the hopper or tubes. By using preventive measures a great deal of the loss from smut can be avoided. This treatment is also effective in preventing oat smut. For further information on the smuts of cereals, see Farmers' Bulletin 507, entitled "The Smuts of Wheat, Oats, Barley, and Corn."

SEED-BED PREPARATION.

Seed-bed preparation includes the preparation of the land for winter and spring crops and the maintenance of summer fallow. It includes also the time and depth of plowing as they affect these operations. Cereals require a firm, well-compacted seed bed.

Results in southern Idaho at present indicate that it makes little difference in the moisture content of fallow whether the stubble land is plowed in the fall or in the spring. Plowing in the spring, however, should be done early, to conserve the most moisture in the soil.

Good plowing is not necessarily deep plowing. Deep plowing is advisable at times in order to break up the plow sole. The annual rainfall over most of the Snake River plains is between 10 and 12 inches. Coming as it does in small quantities throughout the year, it requires only a shallow soil reservoir to catch and hold it. The most successful dry farmers in Idaho plow from 5 to 6 inches deep. The better farmers on the alluvial or mountain-wash soils of the high bench lands usually plow a little deeper and claim that it pays them. On the plains, however, plowing 5 to 6 inches deep is ample.

The first breaking of new land usually is done about 4 inches deep, but it should be 6 inches deep, as the sagebrush roots prevent a good job of shallow plowing. The plow is thrown out of the ground whenever a tough root is struck, which causes an uneven seed bed, only partially plowed.

Winter crops usually are sown on land which has been plowed in spring and then summer fallowed. It is difficult to prepare a good seed bed for winter wheat following a winter-wheat crop. The ground is dry and hard, plows up in large lumps, and too much work is required to reduce it to proper condition. In only one year out of four at the Aberdeen substation has it been possible to make a good seed bed after winter wheat was removed in time to sow winter wheat again by the middle of September. Spring plowing and summer fallowing are the rule.

Disking the stubble land either in the autumn or in the spring before it is plowed is profitable. If only one disking can be given, the work should be done in the spring. The land plows easier, because evaporation is checked and moisture is held. The hard surface crust formed during the growing of the crop is broken up, thus preventing rough, lumpy plowed land. The cut straw is mixed with the surface soil and when turned under is well covered. No air space remains below the furrow slice. More plowing can be done in a day with the same horsepower, as the draft is much less. Weeds are killed, and weed seeds are caused to germinate, so that the young weeds can then be destroyed by the plowing which follows.

For spring crops, land plowed late in the fall gives more satisfactory results than spring-plowed land. This is no doubt due to the looseness of the seed bed on spring plowing. To make a compact seed bed, plowed land must have time to settle. The packer, the corrugated roller, or the disk harrow set straight is a good tool to firm the spring-plowed seed bed for spring crops. However, no implement can do in a short time what months of weathering and settling will accomplish in compacting a seed bed. This firming of the spring-plowed land is done to prevent the drying out of the soil, which would delay the germination and growth of the crop.

Land plowed early in the spring for fallow should be firmed soon after plowing. If harrowing is not sufficient, the packing should be done with a corrugated roller or packer. The various weed-killing tillage operations during the summer help to firm the soil, so that by sowing time in the fall a good seed bed is ready. When early fall rains occur, they aid greatly in firming the summer-tilled land.

Soils which blow readily, such as the light sandy loams east of Camas, Idaho, are difficult to handle. Such land is better farmed in strips about 100 feet wide running at right angles to the prevailing

winds. Every other strip is cropped, and the strips between are fallowed. Disking and stubbling in the seed is about the best means of getting a crop and preventing blowing on these soils. They should not be plowed until considerable stubble has been worked into the surface, and then only shallow plowing should be done until the straw is well mixed with the surface soil.

Southern Idaho dry farmers should summer fallow, as no crops have yet been found that can be grown profitably in place of the summer fallow between two crops of wheat. Moisture is the important thing in crop production on the dry farms of the Snake River plains. Experience shows that summer fallowing stores sufficient moisture to produce a profitable crop of grain every second year. Under the same climatic conditions, cropping every year is usually not profitable, and in years of extreme drought it is a failure. At the Aberdeen Branch Experiment Station in 1915 the average yield of winter wheat sown on fallow was 13.5 bushels, while on land continuously cropped to cereals the yield was only 3 bushels per acre.

The most successful dry farmers in the Snake River plains area are becoming more and more convinced that alternate cropping and fallow is the most profitable way to grow wheat. Spring plowing, summer tilling, and fall sowing distribute the labor well, keeping men and teams busy most of the year.

Plowing for fallow should be done in early spring. At this time the stubble ground is easily worked. By disking the entire field before plowing is begun much moisture is saved, the land plows easier, and a better fallow is prepared.

The main object in cultivating fallow is to kill weeds. They should be killed when very small, as it requires nearly as much moisture to grow a weed crop as it does to grow a crop of grain. The slicker or some other type of weeder should be used for this purpose. The soil is not so finely pulverized with these tools, the cost of operation is about one-third the cost of disking, and a good clod mulch remains. Frequent cultivation is expensive and also fines the soil too much. A fine dust mulch is sure to blow during the dry season.

CEREAL CROPS.

The most important cereal crop in Idaho is wheat. Oats and barley are grown to only a limited extent on the dry farms.

WHEAT.

Hard and soft winter and soft spring wheats are grown. The hard red winter wheats are the leading ones in the section under discussion.

WINTER WHEAT.

Climatic factors make winter wheat the major crop on the dry farms of the Snake River basin. The greater part of the precipitation falls between September and May. A large part of this moisture is stored in the soil and is available for the early spring growth of winter crops.

The winter-wheat crop takes advantage of the earliest growing period in the spring and is often well along before the spring crop is sown. This advances the ripening period of winter wheat and often enables it to escape the drought which usually catches the spring grains at a critical period of their growth.

In varietal tests at the Aberdeen substation the yields of winter wheat have been almost double the yields of spring varieties. On the high bench lands and in the mountain valleys, where more moisture is available at the heading and filling stages, the difference in comparative yield is much smaller. The crop at these elevations, however, is always later, and often there is danger from early fall frosts. The late spring and early summer frosts often kill the wheat at the flowering period. Pasturing winter wheat in the spring to hold back growth until danger of heavy frosts is past often will prevent serious loss from frost. The higher rainfall and lower evaporation assist in making a good yield in spite of spring pasturing.

VARIETIES.

Homesteaders in Idaho often bring with them the crop varieties which they were growing in other States; consequently there is a great mixture of varieties in many sections. The Snake River basin, however, is gradually overcoming this handicap. The Turkey, a hard red winter wheat, is now the predominating variety in this section. This is especially true in the eastern and southern parts and in the districts around Cambridge and Midvale in the western part. A field of Turkey wheat in shock on the Rexburg bench near Rexburg, Idaho, is shown in figure 9.

The results of a 3-year varietal test at the Aberdeen Branch Experiment Station show that the Crimean group of hard red winter wheats is the best. This is true also in nearly all parts of the Snake River plains area. Varieties of this group, which includes the Turkey, Kharkof, Crimean, and Beloglina, have regularly outyielded all other winter wheats. These Crimean wheats are gaining rapidly in acreage in all the dry-land sections of the State. They are recommended as the best dry-farm cash crop. The Turkey is proving the best variety, even up to elevations of 6,500 feet in the mountain sections.

Frost seems to be the greatest obstacle at the higher elevations. In these localities varieties are chosen which yield either a good crop of

grain or a heavy tonnage of hay. The Turkey and related varieties are not so valuable for hay, owing to the beards and the lighter vegetative growth. The Gold Coin, or some beardless spring variety, is grown because it makes a good hay crop if frosted.

The Gold Coin, or Fortyfold, is still being grown in considerable quantity around Ashton and in the American Falls district. This is a beardless variety with brown chaff and soft white kernels, used largely for hay. Usually it is badly mixed with other varieties.

The minor varieties grown in these districts are mostly from the Columbia Basin of Washington. Washington Hybrid Nos. 123 and 143, winter wheats, are now being grown to some extent for hay purposes in the Cambridge and Midvale districts. They make a heavy growth and when left to ripen do not shatter as much as the Gold

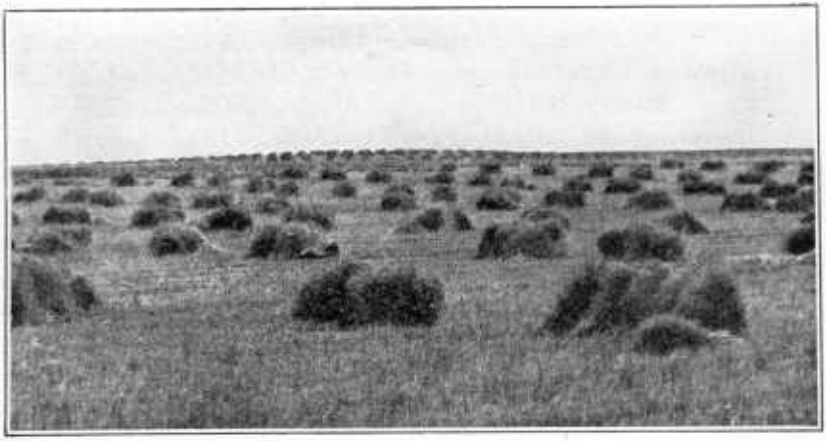

FIG. 9.—A field of wheat in shock on the Rexburg bench, south of Rexburg, Idaho.

Coin. These wheats, however, are not highly valued by the millers and may not be profitable for grain production on the Snake River plains.

TIME OF SOWING.

Winter wheat should be sown when enough moisture is available in the soil to bring up the crop. It is not advisable to sow in dry ground. The time of sowing winter wheat varies with the elevation. At the higher altitudes in the upper Snake River basin it should be sown during August. At about 4,000 feet elevation sowing should be done from August 25 to September 25, and at lower elevations from September 15 to October 15.

Seeding after October 1 above 4,000 feet elevation is not profitable, owing chiefly to slow germination, slow growth, and lack of sufficient vigor to withstand winterkilling. On the other hand, seeding too early, especially at the higher elevations, allows the grain to make too much growth in the fall, and it may come to the flowering stage in

time to be caught by the late spring frosts. The bottom lands at these higher elevations are most subject to frost damage. Late sowing at the high elevations is to be preferred to too early sowing, as snow protects the crop from winterkilling.

RATE OF SEEDING.

The rate of sowing winter wheat varies from 3 to 5 pecks per acre. The 3-peck rate is best in a dry season, while heavier seeding is best in a wet season. Winter wheat is now sown at the Aberdeen substation at the rate of $3\frac{1}{2}$ pecks per acre with satisfactory results. The rate should be decreased somewhat if the sowing is early, and increased if it is late. An increase of half a peck to a peck to the acre should be made if seed swollen from smut treatment is used.

DEPTH TO SOW.

The proper depth to sow wheat varies with the moisture available in the soil. In a firm, moist seed bed the depth should be about 2 inches. On the looser soils where the moisture is deeper, a depth of 3 or 4 inches often is necessary to get seed down to moist soil. It is not advisable to sow deeper than 4 inches. If moisture can not be reached at that depth the seed should be sown shallow if it is necessary to sow before the rain comes.

CULTIVATION OF THE GROWING CROP.

The harrowing of winter wheat in the spring is a local problem. It is not recommended for most of the dry lands of southern Idaho. On the Rockland and Rexburg benches and in the Cambridge district the practice of harrowing winter wheat in the spring is followed to some extent. However, in these sections neighbors often disagree as to the value of such tillage.

Results at the Aberdeen Branch Experiment Station indicate that harrowing winter wheat in the spring is not profitable. The same results were obtained in the Juab Valley of Utah and at the Moro, Oreg., substation. The small increase in yield did not make up for the cost of the labor. If the wheat is to be harrowed the work should not be done until the plants cover the ground well in the spring. Early harrowing causes serious losses in stand. It is probable that the spring-tooth weeder or some similar tool might be used to advantage, as the wheat would be injured less than with the harrow. Harrowing winter wheat in the spring is not recommended for the greater portion of the Snake River plains.

The corrugated roller is being used quite extensively in the spring on winter-wheat fields in the Rockland district to break the crust and close large cracks. The heavier soils in this section bake and

crack after a winter of heavy snowfall, and the corrugated roller does better work in correcting this condition than any other tool yet used.

SPRING WHEAT.

Spring wheats are not profitable crops to grow on the dry lands of most of the Snake River plains, because of a lack of moisture at the time of heading and filling. They can be grown profitably on the high bench lands and in the mountain valleys. Spring wheats are grown to some extent on the Rexburg (Madison County) and Rockland (Power County) benches and in the Montpelier district (Bear Lake County). The soils in these sections are alluvial or mountain wash, and the precipitation is greater than on the plains. However, in all these sections the Turkey will outyield the spring varieties unless injured by frost. At these high elevations snow often remains on the land until late in the spring, making impossible the early preparation of the soil. This delays spring seeding, and the crop is often frosted before ripening. Winter wheats can be sown early in the fall under favorable conditions, and usually make good growth in the spring before spring grain can be sown.

One objection to red wheats on the Rockland bench has been the yellow berry, which is often produced in certain seasons. The market often docks the grower for this wheat. In the last two years white wheat has sold higher than red wheat because of the demand for soft white-wheat flour. This has stimulated the production of white spring wheats in this section.

Spring wheat can be used as a catch crop when winter wheat winterkills or when lack of time prevents sowing enough winter wheat. While good yields of spring wheat sometimes are obtained, it is the average yield in a period of years which counts in selecting the most profitable crop.

VARIETIES.

The Pacific Bluestem is largely grown in nearly all sections where a spring variety is sown. The Sonora is grown in smaller quantity in some localities. On the Rexburg bench the Colorado Special, probably a selection of Defiance wheat, is now the principal variety. It is a new wheat in the State, having been obtained about three years ago. The Little Club, Big Club, and the Pacific Bluestem are grown in the Cambridge-Midvale districts. The Early Baart is being introduced in this section and will probably supplant the other varieties for grain. At the Aberdeen substation and at the Eastern Oregon Dry-Farming Substation at Moro, the Early Baart is one of the highest yielding varieties grown. It is an early, bearded, white wheat.

Spring wheats are not recommended over winter wheats, but it often becomes necessary to grow a small acreage of the former. The Early Baart, Pacific Bluestem, and Colorado Special are leading varieties and are producing the best yields of all spring varieties. The Sonora and Ninety-Day wheats are not recommended. Both are rated low in milling value, and the latter is a badly mixed hybrid.

SEEDING SPRING WHEAT.

Spring wheat should be sown as soon as the frost is out of the ground and the soil warms up a little. The time of sowing will vary considerably with the elevation. At the lower elevations seeding often can be done before April 1. At the middle elevations the usual date is about April 10. High elevations retard the seeding date, as the snow does not melt until late and the excess moisture in the soil prevents early tillage.

Spring wheat should be sown at a rate of 4 to 5 pecks per acre at the low elevations and 5 to 6 pecks at the higher elevations. It is very easy to sow too thick in the lower plains. Spring wheat matures at a time when the weather is very dry and there is little moisture in the soil. If the stand of wheat is too thick there is too much crop for the water available and the yield and quality of grain suffer as a result.

OATS.

On the Snake River plains oats are grown for feed, but not as a commercial crop. In the mountain valleys, however, oats are grown commercially with considerable success. At these elevations moisture is available until the ripening period. Oats, however, are not a very profitable crop on the dry lands of the Snake River plains. Whether at high or low elevations, it is essential that an early variety be sown. This is especially necessary at the high elevations, in order that the crop may mature without danger from August frosts. At the high elevations frost and the length of the growing season are the controlling factors of crop production, as sufficient moisture is usually available.

VARIETIES.

Winter oats are not winter hardy in southern Idaho. Only the early spring varieties should be grown on the dry lands. The Sixty-Day and Kherson are the two highest yielding varieties at the Aberdeen substation and also at the Eastern Oregon Dry-Farming Substation at Moro. At Aberdeen the average yield of the Sixty-Day oats for three years is 38.6 bushels and of the Kherson 32.3 bushels. These are both early yellow oats, originally from southern Russia.

SEEDING SPRING OATS.

The rate of seeding for oats on the dry lands varies from 5 to 7 pecks per acre. On the lower plains the 5-peck rate should be used, because there is comparatively little available moisture. At the higher elevations the heavier rate is used. The rate also varies with the variety. The Sixty-Day and Kherson varieties are small kerneled and do not require heavy sowings to insure a good stand.

BARLEY.

Barley is grown largely for seed in southern Idaho. At the present time it is the crop next in importance to winter wheat on the dry lands. Both winter and spring barleys have been grown at the Aberdeen substation, but only spring barley is grown commonly in southern Idaho.

WINTER BARLEY.

Winter barley is winter hardy only at the lower elevations. It is not recommended for the dry lands in Idaho above an elevation of 3,500 feet. At lower elevations on the Snake River plains, winter barley lives through the winter, and where good stands are assured it is to be preferred to spring barley on dry land. At the Aberdeen Branch Experiment Station, at an elevation of 4,400 feet, a fair crop of winter barley has been produced once in three years. The Tennessee Winter barley has proved to be the best variety.

The rate of seeding winter barley should be 5 to 6 pecks per acre. The time and depth at which to sow and the methods of soil preparation and seeding are the same as for winter wheat.

SPRING BARLEY.

An early variety of spring barley should be grown in order that, like winter wheat, the crop may mature before the summer drought. The two leading varieties at Aberdeen are the Mariout, an early 6-rowed bearded hulled barley, and the White Smyrna, an early 2-rowed bearded hulled variety. The Mariout has averaged 30.9 bushels and the White Smyrna 28.3 bushels in a 3-year period. These varieties are also among the leaders at the Moro, Oreg., substation.

Spring barley is sown at the rate of 5 to 7 pecks per acre, 6 pecks being the normal rate of seeding. If naked or hull-less barley is used, the rate is decreased to 5 pecks. The time and depth of sowing are the same as for spring wheat.

MINOR GRAIN CROPS.

Emmer, spelt, rye, and flax have all been tested at the Aberdeen substation. Of these crops only rye is at all commonly grown in southern Idaho.

EMMER AND SPELT.

Winter emmer and spelt are grown in southern Idaho only in an experimental way. These crops are not as hardy as winter wheat and are not recommended for commercial production. Spring emmer and spelt have not been tested at the Aberdeen substation.

RYE.

Rye is grown to a very limited extent in southern Idaho. Winter rye makes good early pasturage and also makes good hay if cut early. The Ivanof variety is one of the better types. The rate of seeding should be 2 to 2½ pecks per acre. The time and depth of sowing are the same as for winter wheat.

FLAX.

Flax has been grown in a very limited way in a few dry-land sections of the State. Several varieties have been grown at the Aberdeen substation, but the results to date do not justify recommending the crop for commercial production. If tried on a small scale, the seed should be sown at the rate of 15 to 18 pounds per acre.

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